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No. 10-10-234

IN THE

Supreme Court of the United States

RAVI VAIDYANATHAN,
Petitioner,

v.

DAVID J. KAPPOS, UNDER SECRETARY OF COMMERCE FOR INTELLECTUAL PROPERTY AND DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE,
Respondent.

On Petition for a Writ of Certiorari to the United States Court of Appeals for the Federal Circuit

PETITION FOR A WRIT OF CERTIORARI

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August 16, 2010 *Attorneys for Petitioner*

QUESTIONS PRESENTED

5 U.S.C. §706 establishes the scope of judicial review of agency action. This section states in part that the "the reviewing court shall decide *all* relevant questions of law."

The questions presented are:

Whether *de novo* judicial review of a legal conclusion reached by an agency adjudicatory body permits remand to the agency when there is no material question of underlying fact.

Whether *de novo* judicial review of a legal conclusion reached by an agency adjudicatory body requires reversal when the underlying facts as set forth by the agency adjudicatory body, and taken in a light most favorable to that body, are insufficient to reach the agency's ultimate legal conclusion.

PARTIES TO THE PROCEEDING

Pursuant to Rule 14.1(b), the parties here and in the proceeding in the U.S. Court of Appeals for the Federal Circuit are listed.

The petitioner here and appellant below is Ravi Vaidyanathan. The real party in interest is Orbital Research Inc.

Respondent here and appellee below is the Under Secretary of Commerce for Intellectual Property and Director of the U.S. Patent and Trademark Office, currently David J. Kappos.

RULE 29.6 CORPORATE DISCLOSURE STATEMENT

Real party in interest Orbital Research Inc. has no parent company and no publicly held company owns 10% or more of the corporation's stock.

TABLE OF CONTENTS

Page(s)

QUESTIONS PRESENTED i
PARTIES TO THE PROCEEDING ii
RULE 29.6 CORPORATE DISCLOSURE STATEMENT ii
TABLE OF AUTHORITIES v
OPINIONS BELOW 1
JURISDICTION 1
CONSTITUTIONAL PROVISIONS INVOLVED 2
STATUTORY PROVISIONS INVOLVED 2
FEDERAL REGULATIONS INVOLVED 3
STATEMENT OF THE CASE 4
REASONS FOR GRANTING THE PETITION 12
I. THE FEDERAL CIRCUIT STANDS IN CONTRAVENTION OF 5 U.S.C. § 706 FOR IMPROPERLY REMANDING A PURELY LEGAL QUESTION TO AN AGENCY ADJUDICATORY BODY WITH RESPECT TO CLAIMS 8 AND 9 12
II. BY REMANDING WITH RESPECT TO CLAIMS 1-7 INSTEAD OF CONSIDERING ALL RELEVANT QUESTIONS OF LAW IN LIGHT OF THE FACTS OF RECORD, THE FEDERAL CIRCUIT DISREGARDED BOTH STATUTE AND PRECEDENT AND PRODUCED A DECISION YIELDING AN INEQUITABLE OUTCOME 16

TABLE OF CONTENTS-CONTINUED

Page(s)

III. THIS CASE INVOLVES AN ABDICATION OF JUDICAL POWER THAT CONFLICTS WITH STATUTORY LANGUAGE AND CONGRESSIONAL INTENT UNDER 5 U.S.C. §706 AND PRESENTS QUESTIONS OF EXCEPTIONAL IMPORTANCE FOR THOSE DOING BUSINESS WITH U.S. GOVERNMENT AGENCIES AFFECTING OUR NATION'S ECONOMY 25

CONCLUSION 35

APPENDIX A 1a

The opinion of the U.S. Court of Appeals for the Federal Circuit, Appeal No. 2009-1404

APPENDIX B 25a

The opinion of the Board of Patent Appeals and Interferences of the United States Patent and Trademark Office, Appeal No. 2008-2867

APPENDIX C 39a

Figure 1 depicting differences between the Petitioner's claimed method and the method produced using the facts set forth by the Board of Patent Appeals and Interferences.

TABLE OF AUTHORITIES

CASES: Page(s)

Camp v. Pitts, 411 U.S. 138 (1973) 10

Cybor Corp. v. FAS Technologies, Inc., 138 F.3d 1448 (Fed Cir. 1998) 12, 13

Dickinson v. Zurko, 527 U.S. 150 (1999) 8, 26

In re Gartside, 203 F.3d 1305 (Fed. Cir. 2000)...21

Graham v. John Deere Co., 383 U.S. 1 (1966)..... 13, 30, 31

Heckler v. Chaney, 470 U.S. 821 (1999) 8

KSR Int'l, Inc. v. Teleflex, Inc., 550 U.S. 398 (2007) 7, 13

Marbury v. Madison, 5 U.S. 137 (1803) 28

Markman v. Westview Instruments, Inc., 517 U.S. 370 (1996) 12

In re Zurko, 258 F.3d 1379 (Fed. Cir. 2001) 15

CONSTITUTIONAL PROVISIONS:

U.S. Constitution Article 1, § 8, clause 8 ..... 2, 25

STATUTES:

5 U.S.C. § 706 ..... *passim*

28 U.S.C. § 1254 1

28 U.S.C. § 1295(a)(4)(A) 5

35 U.S.C. § 103(a) 3, 5, 13, 29

35 U.S.C. § 134(a) 4

35 U.S.C. § 141 5

TABLE OF AUTHORITIES – CONTINUED

LEGISLATIVE HISTORY: Page(s)

Administrative Procedure Act, Pub. L. No. 79-404, 60 Stat. 237, *reprinted in* 1 Pat McCarran, Administrative Procedure Act, Legislative History, 79th Congress 216 1944-1946 (1946) ... 28, 30, 34-35

FEDERAL REGULATIONS:

37 C.F.R. § 1.104(c)(2) 3, 23

37 C.F.R. § 41.37(c)(1)(vii) 6

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TABLE OF AUTHORITIES – CONTINUED

Page(s)

Economic Study on Patent Backlogs and a System of Mutual Recognition, Final Report To the Intellectual Property Office, London Economics, January 2010 33

The Federalist No. 43 (James Madison) 30

The Federalist No. 51 (James Madison) 27

Malackowski, J. and Barney, J,. Patent Attribution to Equity Returns, January 5, 2009 33

Paul R. Michel, Former Chief Judge U.S. Court of Appeals for the Fed. Cir., Address to USPTO Examiners (April, 2010) 32

Petitioner Ravi Vaidyanathan hereby petitions for a writ of certiorari to review the judgment of the United States Court of Appeals for the Federal Circuit entered in this action.

OPINIONS BELOW

The opinion of the U.S. Court of Appeals for the Federal Circuit (App., *infra*, 1a-24a), Appeal No. 2009-1404, was marked nonprecedential and is reported at *In re Vaidyanathan*, No. 2009-1404, 2010 U.S. App. LEXIS 10189 (May 19, 2010).

The opinion of the Board of Patent Appeals and Interferences of the United States Patent and Trademark Office (App., *infra*, 25a-38a), *Ex parte Vaidyanathan*, Appeal No. 2008-2867 (B.P.A.I. March 11, 2009), is not reported.

JURISDICTION

The final judgment of the Court of Appeals was entered on May 19, 2010. The jurisdiction of this Court is invoked under 28 U.S.C. § 1254(1).

CONSTITUTIONAL PROVISIONS INVOLVED

"The Congress shall have Power... To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." U.S. CONST. art. 1, § 8, cl. 8.

STATUTORY PROVISIONS INVOLVED

"To the extent necessary to decision and when presented, the reviewing court shall decide all relevant questions of law, interpret constitutional and statutory provisions, and determine the meaning or applicability of the terms of an agency action. The reviewing court shall—

(1) compel agency action unlawfully withheld or unreasonably delayed; and

(2) hold unlawful and set aside agency action, findings, and conclusions found to be—

(A) arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law;

(B) contrary to constitutional right, power, privilege, or immunity;

(C) in excess of statutory jurisdiction, authority, or limitations, or short of statutory right;

(D) without observance of procedure required by law;

(E) unsupported by substantial evidence in a case subject to sections 556 and 557 of this title or otherwise reviewed on the record of an agency hearing provided by statute; or

(F) unwarranted by the facts to the extent that the facts are subject to trial de novo by the reviewing court.

In making the foregoing determinations, the court shall review the whole record or those parts of it cited by a party, and due account shall be taken of the rule of prejudicial error." 5 U.S.C. § 706.

"A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made." 35 U.S.C. §103(a).

FEDERAL REGULATIONS INVOLVED

"In rejecting claims for want of novelty or for obviousness, the examiner must cite the best references at his or her command. When a reference is complex or shows or describes inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable. The pertinence of each reference, if not apparent, must be clearly explained and each rejected claim specified." 37 C.F.R. § 1.104(c)(2).

STATEMENT OF THE CASE

Proper judicial review of federal agency action under 5 U.S.C. § 706 (2007) ("§ 706") is critical inasmuch as it provides a vital check on actions of the Executive branch carried out through its various agencies. However, if, as in the present case, a reviewing court fails to fully and properly execute the duties required by § 706 the result is not only the frustration of the judicial review process, but also the improper abdication of a portion of the reviewing court's judicial power to an arm of the Executive branch.

In the present case, Petitioner Vaidyanathan filed the application for patent from which this petition stems on September 28, 2002. Briefly stated, the invention claimed in Vaidyanathan's patent application involves a method of controlling a munition, vehicle or aircraft (hereinafter collectively referred to as "missile" or "munition") by using a series of specific steps. These steps include: (1) receiving information from sensors; (2) using a neural network to process this information and generate a desired trajectory for the munition to follow; (3) inputting the desired trajectory generated by the neural network as well as information received from sensors into an autopilot; and (4) having the autopilot then control the munition to fly the desired trajectory and other sensor information received. *See* App. 3a.

Dissatisfied with the rejections received from the Patent and Trademark Office ("PTO") examiner, Vaidyanathan appealed to the PTO's Board of Patent Appeals and Interferences ("Board") on January 13, 2006 for review of the examiner's determinations pursuant to 35 U.S.C. § 134(a) (2007). The sole issue on appeal before the Board was whether Petitioner's

claims 1-11 were improperly held to be unpatentable by the PTO examiner for being obvious under the standards set forth in 35 U.S.C. § 103(a) (2007).

The Board issued its decision in the Petitioner's appeal on March 11, 2009. *See* App. 25a-38a. In its decision the Board affirmed the examiner's rejection of claims 1-9 while reversing the examiner's rejection of claims 10 and 11. *See* App. 36a, 38a. In reaching its decision, the Board specifically set forth and relied upon ten factual findings advanced under its perception and understanding of the references cited by the examiner. App. 29a-32a.

Believing the Board's reasoning for its affirmance of the examiner's rejection of claims 1-9 to be in error, Vaidyanathan appealed from the Board's decision to the United States Court of Appeals for the Federal Circuit on May 5, 2009, invoking the jurisdiction of the Federal Circuit pursuant to 28 U.S.C. § 1295(a)(4)(A) (2007) and 35 U.S.C. § 141 (2007).

The Federal Circuit issued its decision on May 19, 2010 in a nonprecedential opinion vacating all of the Board's rejections and remanding the case for further development of the record and full reconsideration by the PTO. *See* App. 1a-24a.

In reaching its decision, the Federal Circuit, like the Board below it, considered claims 8 and 9 separately from claims 1-7. The Petitioner likewise herein addresses claims 8 and 9 separately from claims 1-7.

It is significant that in its affirmance of the examiner's rejection of claims 8 and 9 below, the Board expressly admitted that the references it relied upon were insufficient, in and of themselves, to render

these claims obvious.[1] As a result of this deficiency, the Board was left to support its rejection of claims 8 and 9 with semantic argument directed at why its interpretation of claim 9 provided a valid avenue for affirming the examiner's rejection.[2]

The effect of the Board's express recognition of the inadequacy of the factual record, and its subsequent reliance on semantic argument, was to unmistakably remove any question of underlying fact regarding the obviousness of claims 8 & 9. Thus, the only remaining questions before the Federal Circuit respecting claims 8 and 9 were the legal questions of (1) the accuracy of the Board's claim construction and (2) whether claims 8 and 9 were obvious based on this construction.

In addressing the Board's semantic argument advanced in support of its construction of claims 8 and 9, the Federal Circuit noted simply and incisively that the "Board's interpretation of claim 9 finds no support in the [Petitioner's] specification, and is not a reasonable interpretation under the rules of claim construction." App. 24a. The Federal Circuit went on to provide its own interpretation of claim 9 noting:

> The description in the [Petitioner's] specification consistently indicates that the neural network guides the munition all the

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[1] Specifically, the Board expressly admitted that it "agree[d] with Appellant that Biggers *does not* teach using the neural network to guide the missile all the way to intercept." App. 35a (emphasis added).

[2] The Board selected claim 9 as representative of claims 8 and 9 pursuant to 37 C.F.R. § 41.37(c)(1)(vii) (2008). Thus, the question of obviousness of both claims 8 and 9 hinged on the interpretation of only claim 9.

> way to intercept. The [Petitioner's] specification uses the word "strike" synonymously with "intercept," foreclosing the divergent meanings the Board seeks to attach to these terms.

App. 24a. Having thus decided the legal question of claim construction, and having established a correct interpretation of the claims, the Federal Circuit then vacated the Board's rejection of claims 8 and 9 and remanded claims 8 and 9 to the PTO. Significantly, however, the Federal Circuit did not decide the legal question of the obviousness of claims 8 and 9 despite the fact that this was the only remaining question before that court regarding claims 8 and 9.

With respect to claims 1-7, the Federal Circuit faulted the PTO for failing to provide adequate and proper support for its conclusions. Among other observations, the Federal Circuit recognized that three different rationales had been successively advanced by the patent examiner, the Board and the PTO Solicitor to support the rejection of Vaidyanathan's claims 1-7. *See* App. 14a. Referencing the Solicitor's most recent shift in rationale, the Federal Circuit noted that "[t]his third retooling of the PTO position...casts serious doubt upon the sufficiency of the support for any set of findings relating to the teachings of [the] Biggers [reference relied upon by the PTO]." App. 14a. The Federal Circuit further candidly pointed out to the PTO that "*KSR* [*Int'l, Inc. v. Teleflex, Inc.*, 550 U.S. 398 (2007)] did not free the PTO's examination process from explaining its reasoning." App. 19a. After vacating all of the Board's rejections with respect to claims 1-7, the Federal Circuit remanded claims 1-7 to the PTO with the re-

minder that "[i]f there is neither record evidence nor detailed examiner reasoning, the Board should not conclude that Vaidyanathan's claims are obvious." App. 21a. An important fact in the present petition is that claims 1-7 were remanded by the Federal Circuit despite Vaidyanathan's argument before that court that even if one were to assume the Board's factual findings were fully and properly supported by the record, these findings were and are still inadequate to support the Board's affirmance of the examiner's rejection.

While the Petitioner is genuinely appreciative of the Federal Circuit's expertise and that circuit's commendable job of directly and candidly pointing out the errors made by the PTO, the Petitioner nevertheless finds fault with the Federal Circuit on grounds of its failure to conduct its review in accordance with the minimum requirements set forth in 5 U.S.C. § 706.

It is well settled that § 706 sets the scope of judicial review of federal agency action. *See, e.g., Heckler v. Chaney*, 470 U.S. 821, 828 (1985). This includes review of action by the PTO. *See Dickinson v. Zurko*, 527 U.S. 150, 152 (1999). Significantly, § 706 sets both an upper as well as a lower threshold within which a reviewing court is to operate. This means that judicial error in review of agency action can be committed by *both* overstepping a court's reviewing powers *as well as* failing to provide review that meets statutory minimums. This latter form of error is particularly troublesome in that failure of a reviewing court to perform review sufficient to meet statutory minimums inherently entails abdicating a portion of that court's power to the Executive branch via the agency whose decision is being reviewed.

In the present case, Vaidyanathan petitions this Court for a writ of certiorari to the Federal Circuit on the narrow grounds of the questions of (1) whether § 706 permits a reviewing court to remand to an agency questions that are purely questions of law and (2) whether § 706 requires reversal of an agency's decision when the facts as set forth by the agency, no matter how they are construed, fail to support the agency's conclusion.

As previously mentioned, the Federal Circuit vacated all of the Board's rejections and remanded Vaidyanathan's case for full reconsideration by the PTO. However, under § 706 a reviewing court's ability to remand and vacate an agency decision is limited to two situations: (1) those in which there is inadequate factual support for the agency's conclusions; and (2) those in which an agency has operated outside the bounds of law or equity by overstepping the authority provided to it by its governing statute, failing to perform duties required of it by its governing statute, violating constitutional requirements, violating procedural requirements, or otherwise violating the law.

Specifically, § 706(2) dictates that a reviewing court shall:

> hold unlawful and set aside agency action, findings, and conclusions found to be—(A) arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law; (B) contrary to constitutional right, power, privilege, or immunity; (C) in excess of statutory jurisdiction, authority, or limitations, or short of statutory right; (D) without observance of procedure required by

> law; (E) unsupported by substantial evidence in a case subject to sections 556 and 557 of this title or otherwise reviewed on the record of an agency hearing provided by statute; or (F) unwarranted by the facts to the extent that the facts are subject to trial de novo by the reviewing court.

5 U.S.C. § 706(2). This Court has understood "hold unlawful and set aside" to mean that the reviewing court must vacate the decision of the agency and remand the case to the agency. *See Camp v. Pitts*, 411 U.S. 138 (1973) ("If [the Comptroller's] finding is not sustainable [under § 706(2)] on the administrative record made, then the Comptroller's decision *must be vacated and the matter remanded to him* for further consideration") (emphasis added). Thus, a reviewing court's discretion to vacate and remand (i.e. hold unlawful and set aside) in conducting review of agency action is limited by § 706(2) to instances in which an agency has acted outside the bounds of law or equity, *see* 5 U.S.C. § 706(2)(A–D), or has failed to provide sufficient factual support for its conclusions, *see* 5 U.S.C. § 706(2)(A), (E–F).

Importantly, the discretion to vacate and remand provided by § 706 does not extend to a court's review of an agency's conclusions regarding questions of law. Rather, as expected, questions of law, even in judicial review under § 706, exist in a universe wholly isolated to the judiciary. It is not surprising then that § 706 requires that "[t]o the extent necessary to decision and when presented, the reviewing court *shall decide all relevant questions of law*" (emphasis added).

Likewise, § 706 does not provide the option of vacating and remanding, *even if there is a factual dispute*, when the underlying facts in dispute, taken in a light most favorable to the agency, still fail to support the agency's conclusion. This is because if facts are construed in a light most favorable to the agency and there is no allegation of illegal or inequitable action on the part of the agency, then the only remaining question before the reviewing court is, by default, one of law.

Thus, a reviewing court's discretion to remand and vacate an agency's decision under § 706 review is limited by § 706(2) to certain specific circumstances. For situations outside of this, remand is improper and a reviewing court must instead decide all questions of law and, if needed, compel agency action unlawfully withheld or unreasonably delayed as required by § 706(1).

As alluded to, the Petitioner finds fault with the Federal Circuit's remanding claims 8 and 9 since the only questions before the Federal Circuit with regard to claims 8 and 9 were questions of law.

Further, the Petitioner finds fault with the Federal Circuit's remanding claims 1-7 in disregard of the Petitioner's arguments before that court that even if one were to assume the Board's findings are supported by substantial evidence, these findings still fail both to meet the limitations required by Petitioner's claims and to support the Board's alleged motivation to combine the references it relied upon.

Each of these issues is addressed in greater detail below in the Petitioner's reasons for granting the petition.

REASONS FOR GRANTING THE PETITION

I. THE FEDERAL CIRCUIT STANDS IN CONTRAVENTION OF 5 U.S.C. § 706 FOR IMPROPERLY REMANDING A PURELY LEGAL QUESTION TO AN AGENCY ADJUDICATORY BODY WITH RESPECT TO CLAIMS 8 AND 9

As the Petitioner has just noted in his above Statement of the Case, the Federal Circuit is duty-bound when reviewing agency action under the Administrative Procedure Act ("APA") to "decide *all* relevant questions of law" presented to it. 5 U.S.C. § 706 (emphasis added). In the present case, the only remaining questions before the Federal Circuit respecting claims 8 and 9 were the legal questions of (1) the accuracy of the Board's construction of claim 9 and (2) whether claims 8 and 9 were obvious based on this construction.

By remanding claims 8 and 9 before addressing the legal question of obviousness, the Federal Circuit failed to adhere to its statutorily-imposed duty to decide all relevant questions of law. Accordingly, the Petitioner now requests that this Court exercise its supervisory powers by conducting its own review and holding that the Federal Circuit erred in pursuing this course of action.

It is well settled that claim construction is a "purely legal question," *Cybor Corp. v. FAS Technologies, Inc.*, 138 F.3d 1448, 1456 (Fed. Cir. 1998), and thus falls "exclusively within the province of the court." *Markman v. Westview Instruments, Inc.*, 517 U.S. 370 (1996) (Markman II). As such, the Federal Circuit reviews "claim construction *de novo* on ap-

peal." *Cybor Corp.*, 138 F.3d 1448, 1456 (Fed. Cir. 1998).

Further, as this Court stated in *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966), "the ultimate question of patent validity is one of law." This includes the question of obviousness as set forth in 35 U.S.C. § 103. *See* KSR v. Teleflex, 550 U.S. 398, 427 (2007) ("The ultimate judgment of obviousness is a legal determination" (citing to *Graham v. John Deere*, 383 U. S. 1 (1966))).

However, while the Federal Circuit did properly decide the legal question of claim construction in the present case, it failed to take the required next step of addressing the question of obviousness with respect to claims 8 and 9. Since obviousness is a question of law reviewed *de novo* on appeal, this failure places the Federal Circuit in breach of its statutorily-imposed duty to "decide all relevant questions of law." 5 U.S.C. § 706.

In particular, the Federal Circuit's holding below that the Board's rejection of claims 8 and 9 was based on an incorrect interpretation of claim 9 conclusively eliminated the Board's last line of defense supporting its assertion that claims 8 and 9 were obvious. Thus, by its own action, the Federal Circuit was left squarely facing the final remaining legal question of the obviousness of claims 8 and 9. However, instead of squarely addressing this question, reversing the Board, and holding that claims 8 and 9 are not obvious, the Federal Circuit faltered and improperly remanded the case to the Board "for reconsideration under the correct interpretation of the claims." App. 24a.

Because § 706 requires that the reviewing court decide all relevant questions of law and limits the

discretion to remand to certain specific situations, and because questions of law are to be reviewed *de novo*, the Federal Circuit should have been left with only two options in facing the question of the obviousness of claims 8 and 9: affirm or reverse.

In addition to the fact that deciding questions of law is a statutory requirement, the inherent nature of a question of law further mandates that it be decided by the appellate body and not remanded to the agency. In other words, deciding questions of law is *the* primary duty of an appellate court and an appellate court's failure to answer questions of law about which there is no factual dispute or other grounds for remand results in nothing less than the frustration of the entire appellate process. Indeed, this is exactly what occurred in the present case.

In the specific light of the present case, Vaidyanathan appealed to the Federal Circuit on the legal question of obviousness, and in view of the facts as set forth and the holding of the Federal Circuit below, the Federal Circuit should have had no other choice than to reverse the Board with respect to its determination of the obviousness of claims 8 and 9. Significantly, this appeal by the Petitioner was lodged with the Federal Circuit precisely because the Petitioner believed that the law of obviousness was misapplied by the Board and that *de novo* review by the Federal Circuit was the only proper way that this misapplication could be corrected. However, by remanding the legal question of obviousness to the Board, the Federal Circuit frustrated the fundamental purpose of appellate review by leaving the Petitioner in the same position as before his appeal and by providing yet another opportunity for the PTO to construct additional reasoning and provide new facts

to support its assertions of obviousness. At its best, this approach yields a result clearly inequitable to the Petitioner; at its worst, the result is the abdication by the Federal Circuit of its statutorily-imposed duties to provide *de novo* review of questions of law to an agency of the Executive branch. Either result is plainly unacceptable.

If, as the Federal Circuit has recognized, a lack of support for factual findings "render[s] the process of appellate review...a meaningless exercise," *In re Zurko,* 258 F.3d 1379, 1386 (Fed. Cir. 2001), then surely lack of any appellate review of questions of law, including that of obviousness, multiplies this effect.

In view of the above arguments, it is clear that in merely remanding claims 8 and 9 to the PTO the Federal Circuit violated not only its statutorily-imposed duty under 5 U.S.C. § 706 to review *all* relevant questions of law but also condoned a result that frustrates the appellate process, exceeds its remedial discretion as set forth in § 706(2), and is inequitable to the Petitioner. Accordingly, the Petitioner now requests that this Court exercise its supervisory powers and correct this error by granting this petition and subsequently conducting its own *de novo* review squarely addressing the question of the obviousness of claims 8 and 9.

II. BY REMANDING WITH RESPECT TO CLAIMS 1-7 INSTEAD OF CONSIDERING ALL RELEVANT QUESTIONS OF LAW IN LIGHT OF THE FACTS OF RECORD, THE FEDERAL CIRCUIT DISREGARDED BOTH STATUTE AND PRECEDENT AND PRODUCED A DECISION YIELDING AN INEQUITABLE OUTCOME

In contrast to claims 8 and 9, which do not involve any substantive questions of fact, claims 1-7 were remanded by the Federal Circuit to the Board for "further development of the record," App. 15a, and to provide the Board an opportunity to "determine obviousness based on evidence of record or on the examiner's detailed and articulated reasoning." App. 21a.

However, remand by the Federal Circuit to the Board on these grounds resulted in judicial error sufficiently egregious to merit the exercise of this Court's supervisory powers. Specifically, in so quickly remanding to the Board, the Federal Circuit failed to address the Petitioner's arguments advanced before it below that even if, *arguendo*, one were to accept the Board's factual findings as fully supported by sufficient reasoning and substantial evidence, and thereby remove any questions of fact before the Federal Circuit, the Board's findings would *still fail* to render the claimed invention unpatentable on grounds of obviousness. Failure by the Federal Circuit to address this argument made before it by the Petitioner constitutes error worthy of the exercise of this Court's supervisory powers because this failure: (1) resulted in the Federal Circuit's departing from both statutorily- and precedentially-imposed standards of review; and (2) yields an outcome that is clearly inequitable to the Petitioner.

The Fundamental Inadequacy of the Board's Findings as Presented Before the Federal Circuit

In its opinion below, the Board set forth and relied upon ten factual findings to support its affirmance of the PTO examiner's rejection of Vaidyanathan's claims 1-7. *See* App. 29a-32a. Setting aside any doubts or questions regarding the validity of these factual findings, and taking these findings in a light most favorable to the Board, the Board's findings teach a number of specific steps. Significantly, however, the steps produced by the Board's factual findings, no matter how they are construed, fail to render the claimed invention unpatentable as obvious because these steps fail to read on the Petitioner's claims, much less to support the reasoning given by the Board for combining the references it relied upon in affirming the PTO examiner's rejection of Vaidyanathan's claims 1-7.

Figure 1, included in Appendix C (App. 39a), is provided to illustrate the fundamental inadequacy of the Board's factual findings by supplying an element-by-element comparison of the method produced using the Board's facts with the method of the claimed invention.

With reference to Figure 1, the Petitioner would draw specific attention to the fact that the neural network of the claimed method produces only a trajectory, or path, for the missile to follow, whereas the Board's factual findings establish a neural network that outputs *only* angles of attack to be followed by the missile. In other words, the neural network produced by the Board's facts includes the more time consuming substitute step of using the neural net-

work to calculate and output angles of attack, while Vaidyanathan's claimed neural network has the more limited function of producing only a trajectory that is outputted for the missile to follow and leaves the step of calculating angles of attack to the autopilot that is used to "[control the missile] to fly the desired trajectory." App. 3a.

It is rudimentary patent law that a method that uses, for example, steps A, B, and D cannot be said to render obvious a different method that uses, for example, steps A, C, and D. However, this is precisely the result if one compares the method established by the Board's factual findings with the Petitioner's claimed method. Moreover, the Board claimed that the method produced by its factual findings was "nothing more than the predictable use of prior art elements according to established functions." However, in light of Figure 1 it becomes apparent that the Board's facts cannot be said to render Vaidyanathan's method obvious based on the use of prior art elements according to established functions because the autopilot of the claimed invention and the Board's autopilot perform two *different* functions. Again, the Petitioner would note that these differences were pointed out to the Federal Circuit in his reply brief below but that the Federal Circuit failed to address these arguments. *See* Reply Br. Of Appellant (Dec. 7, 2009) at 8-10.

In advancing and relying on Figure 1, the Petitioner wishes to emphasize that Figure 1 is not presented to this Court as part of an ongoing factual dispute, nor is Figure 1 meant to support a factual argument. Rather, Figure 1 is advanced as part of a legal argument that asks the question of whether a court reviewing agency action under § 706 has an ob-

ligation to reverse the agency when the facts as set forth by the agency and taken in a light most favorable to the agency are still fundamentally inadequate to support the agency's conclusions. Accordingly, Figure 1 is used to help frame this legal question by succinctly and accessibly setting forth the Board's factual findings as they were presented before the Federal Circuit and comparing these factual findings to the claimed invention.

In light of the differences between the claimed invention and the Board's factual assertions as illustrated in Figure 1, it becomes clear that any amount of articulated reasoning or development of the record by the Board would fail to make the facts set forth by the Board sufficient to render the claimed invention obvious. Thus, it was clear error for the Federal Circuit to remand Petitioner's claims 1-7 to the Board for further development of the record, since such an action was not only a violation of statutorily- and precedentially-imposed duties, but also resulted in an outcome that is clearly inequitable to the Petitioner. These grounds of error are discussed in greater detail below.

The Federal Circuit was Bound by Both Statute and Precedent to Review the Arguments Made Below by the Petitioner

In its opinion below, the Federal Circuit made much of the PTO's changing factual positions. *See, e.g.*, App. 15a ("the PTO's shifting positions do not assist in appellate review"). However, while the PTO's changing factual positions are significant inasmuch as they cast doubt on the validity of the Board's factual findings, such changing factual positions should not be allowed to prematurely end,

through remand, Federal Circuit review of PTO action—especially in cases where, as here, it has been alleged that the facts relied upon are inadequate to support the Board's conclusions even if one assumes that these facts are properly supported by the record. For the Federal Circuit to remand in such cases is problematic because it places that circuit in breach of both statutorily- and precedentially-imposed duties to consider all arguments advanced before it in light of the facts as set forth by the Board and to decide any questions of law advanced in such arguments. Further, to remand in the shadow of such duties and the facts of the present case places the Federal Circuit in clear violation of the principles of judicial economy.

The logic sequentially advanced below in faulting the Federal Circuit for failing to fully consider Petitioner's arguments is both statutorily sound and squares well with common sense.

First, § 706 requires that the reviewing "court shall review the *whole* record" (emphasis added). Thus, the Federal Circuit is bound in reviewing appeals from the PTO to consider the whole record. Certainly review of the "whole record" includes considering the merits of each respective argument advanced by the parties and deciding these arguments in an equitable and efficient manner—not simply faulting the PTO for its weak factual support and remanding to the PTO for another chance to set forth new factual findings.

Further, the Federal Circuit's own precedent expressly dictates that the Federal Circuit is bound to review a case originating in the PTO based on the *factual findings set forth by the Board*—not those advanced by the PTO examiner or the PTO solicitor.

Indeed, the Federal Circuit expressly admitted this in its opinion below, noting that "[its] review is constrained by the facts that were developed during the Board proceeding." *See* App. 14a. *See also In re Gartside*, 203 F.3d 1305, 1311-1312 (Fed. Cir. 2000). Thus, it is plainly in violation of the Federal Circuit's own precedent to allow confusion between the PTO examiner, the Board, and the PTO solicitor to lead to a failure to consider a case based on the *Board's factual findings*. Certainly such confusion should detract from the credibility of the Board's facts[3], but there is no room in § 706 nor Federal Circuit precedent to allow such confusion to excuse the Federal Circuit's failure to consider all of the Petitioner's arguments against the backdrop created by the Board's factual findings.

Additionally, as already mentioned, the Petitioner in his briefs below expressly asked the Federal Circuit to review the Board's legal conclusion of obviousness with respect to claims 1-7 by assuming *arguendo*, that the Board's factual findings were supported by substantial evidence and requested that it decide the case based strictly on the facts as set forth by the Board, since these facts, even taken in the light most favorable to the Board, are wholly inade-

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[3] Indeed, the Federal Circuit expressly recognized this when it noted in its opinion below that "[t]his third retooling of the PTO position, without additional development of the record, casts serious doubt upon the sufficiency of the support for any set of findings relating to the teachings of [the references relied upon]." App. 14a. *See also Universal Camera Corp. v. NLRB*, 340 U.S. 474, 496 (1951) ("evidence supporting a conclusion may be less substantial when an impartial, experienced examiner who has observed the witnesses and lived with the case has drawn conclusions different from the Board's than when he has reached the same conclusion").

quate to support the Board's conclusions. *See* Reply Br. Of Appellant (Dec. 7, 2009) at 8-10. This action before the Federal Circuit by the Petitioner moved the question of the obviousness of claims 1-7 from being a mixed question of law and fact to one of purely law.

Finally, as set forth in the Petitioner's above Statement of the Case, § 706 requires that the reviewing court decide *all* questions of law and that remand of questions of law is clearly improper under § 706.

Thus, in light of the reasoning set forth in the preceding paragraphs, the Federal Circuit was bound by both statute and its own precedent to consider Petitioner's legal arguments made in the alternative below that even if the *Board's facts* were to be taken as fully supported by the record, these facts are still inadequate to support the Board's conclusions.

However, instead of properly considering the Petitioner's above-noted arguments, the Federal Circuit, in effect, allowed itself to be distracted by the underlying factual dispute and the lure of quickly, though improperly, disposing of Vaidyanathan's case on purely factual grounds. Yet, when one considers the clear differences depicted in Figure 1 between the method produced by the Board's facts and the claimed method, it becomes apparent that reversal of the Board, not mere remand, is the course that should have been followed by the Federal Circuit.

Indeed, the principles of judicial economy further dictate that reversal of the Board on the facts as set forth by the Board should have occurred, since judicial economy would direct that if a narrower and less time-consuming route can be taken without prejudice

to the parties, that this route should, in fact, be taken.

The Federal Circuit's Choosing to Remand Instead of Fully Reviewing the Petitioner's Arguments Resulted in an Inequitable Outcome

It has now been nearly eight years since the Petitioner first filed the patent application at issue in the present case. During this time, the PTO has had ample opportunity to set forth its best case in support of its allegations that Vaidyanathan's claims 1-7 are unpatentable. Indeed, by the PTO's own regulations a patent examiner is required to use the best references at his or her command in attempting to establish the unpatentability of a claimed invention, and there has been no indication, much less a conclusory assertion, that such was not the case here. *See* 37 C.F.R. § 1.104(c)(2)(2009) ("In rejecting claims for want of novelty or for obviousness, the examiner must cite the best references at his or her command").

It is thus a required assumption that the best references to be had by the PTO are already on the record. However, reflecting again on Figure 1 in Appendix C (App. 39a), it becomes clear that the Board's factual findings based on these best references cannot sustain the Board's allegations of unpatentability since these facts fail to cover Vaidyanathan's claimed invention, much less to support the Board's reasoning advanced in its affirmance of the examiner's rejection of Vaidyanathan's claims 1-7. Thus, the Federal Circuit's remand of the present case to the Board yielded an inequitable outcome because it is essentially nothing more than an opportu-

nity for the PTO to once again "move the target" by setting forth yet another set of factual findings.

More specifically, by remanding in this instance, the Federal Circuit appears to have failed to appreciate that there is a distinct difference between a reviewing court remanding a case for lack of support for factual findings set forth by an agency and remanding a case when the facts as set forth by the agency, no matter how they are construed and no matter how much support they have, are clearly inadequate to support the agency's conclusions. In the former case remand is justified because it allows the agency a chance to fully explain how it reached its factual conclusions based on evidence of record. However, in the latter case, remand is nothing more than a license for the agency to change its facts to better support its current stance. In other words, remanding to an agency adjudicatory body to allow that body the opportunity to garner greater support for *existing facts* is one thing; but remanding in a situation in which the existing facts as set forth are clearly inadequate to support the agency's conclusion is nothing less than an invitation for the agency to advance an *all new* set of facts.

Indeed, in its analysis of Vaidyanathan's case, the Federal Circuit clearly recognized that the PTO has revised its factual position three times already. *See, e.g.*, App. 14a ("Thus the PTO has now provided a third explanation of why [the references cited by the PTO teach what the PTO alleges]"). However, instead of reversing the PTO and ending the case, the Federal Circuit chose to remand the case to the Board, providing the PTO with a highly prejudicial *fourth* "bite at the apple" or additional chance to revise its facts to support improper legal conclusions.

Clearly such an approach yields an inequitable outcome since it allows an agency to continue to produce new facts *ad nauseum* and forces the party opposing the agency to expend needless time and effort in attempting to hit an ever-moving factual target.

In light of the Federal Circuit's departing from the requirements of both statute and precedent, and its promulgating a decision that yields an inequitable outcome, the Petitioner now earnestly requests that this Court exercise its supervisory powers to conduct a full and proper *de novo* review of this case and correct the Federal Circuit.

III. THIS CASE INVOLVES AN ABDICATION OF JUDICAL POWER THAT CONFLICTS WITH STATUTORY LANGUAGE AND CONGRESSIONAL INTENT UNDER 5 U.S.C. §706 AND PRESENTS QUESTIONS OF EXCEPTIONAL IMPORTANCE FOR THOSE DOING BUSINESS WITH U.S. GOVERNMENT AGENCIES AFFECTING OUR NATION'S ECONOMY

The United States Constitution provides Congress with the power to "promote the Progress of Science and useful Arts, by securing for limited Times to...Inventors the exclusive Right to their respective...Discoveries." U.S. CONST. art. 1, § 8, cl. 8. Pursuant to this power, Congress enacted title 35 of the United States Code which governs, among other things, the grant of patents and sets the boundaries within which the PTO is to operate. Thus, the PTO is governed by title 35 of the United States Code and, as a federal administrative agency, is also governed

by the APA. *See Dickinson v. Zurko*, 527 U.S. 150, 152 (1999).

Following the Great Depression and World War II, Congress became concerned with the expanding powers that federal agencies possessed, and this concern led to the enactment of the APA as a means to regulate and standardize federal agency procedures as well as judicial review of those procedures. *See* DANIEL HALL, *ADMINISTRATIVE LAW BUREAUCRACY IN A DEMOCRACY*, 2 (4th ed. 2008). Because federal agencies operate as an arm of the Executive branch the creation and function of federal agencies can raise separation of powers issues under the United States Constitution requiring various checks and balances. *See, e.g.*, *AM. BAR ASS'N, SECTION OF ADMIN. LAW AND REG. PRACTICE, DEVELOPMENTS IN ADMINISTRATIVE LAW AND REGULATORY PRACTICE (Jeffrey Lubbers ed. 2003); DOUG LINDER, SEPARATION OF POWERS* (2010), http://www.law.umkc.edu/faculty/projects/ftrials/conlaw/separationofpowers.htm. By providing a structured framework for the regulation of government agencies and their varied roles, the APA effectively implements constitutional safeguards which protect the rights of individuals as well as the agencies themselves against other branches and agencies of government. According to the Attorney General's Manual on the Administrative Procedure Act drafted after the 1946 enactment of the APA, the basic purposes of the APA are: (1) to require agencies to keep the public informed of their organization, procedures and rules; (2) to provide for public participation in the rulemaking process; (3) to prescribe uniform standards for the conduct of formal rulemaking and adjudicatory proceedings; and *(4) to*

restate the scope of judicial review. Tom Clark, Attorney General's Manual on the Administrative Procedure Act (1947), *available at* http://www.law.fsu.edu/library/admin/1947cover.html (emphasis added).

Many have commented on the central and critical role of separation of powers and checks and balances, perhaps none better than James Madison in The Federalist No. 51:

> [i]f men were angels, no government would be necessary. If angels were to govern men, neither external nor internal controls on government would be necessary. In framing a government which is to be administered by men over men, the great difficulty lies in this: you must first enable the government to control the governed; and in the next place oblige it to control itself. A dependence on the people is, no doubt, the primary control on the government; but experience has taught mankind the necessity of auxiliary precautions. The policy of supplying, by opposite and rival interests, the defect of better motives, might be traced through the whole system of human affairs, private as well as public. We see it particularly displayed in all the subordinate distributions of power, where the constant aim is to divide and arrange the several offices in such a manner as that each may be a check on the other – that the private interest of every individual may be a sentinel over the public rights. These inventions of prudence cannot be less

> requisite in the distribution of supreme powers of the State.

THE FEDERALIST NO. 51 (James Madison).

Chief Justice John Marshall, in writing for the Court, established the principle of judicial review as an important addition to the system of "checks and balances" created to prevent any one branch of the Federal Government from becoming too powerful. *See Marbury v. Madison*, 5 U.S. 137 (1803). Implementing an effective system of checks and balances is further what Congress intended when enacting the APA. The legislative history of that Act, in pertinent part, states

> Judicial review is of *utmost importance*, but it can be operative in relatively few cases because of the cost and general hazards of litigation. It is indispensable since its mere existence generally precludes the arbitrary exercise of powers...By enacting this bill, the Congress...will be laying down for the guidance of all branches of the Government and all private interests...a policy respecting the *minimum requirements of fair administrative procedure.*

ADMINISTRATIVE PROCEDURE ACT, Pub. L. No. 79-404, 60 Stat. 237, *reprinted in* 1 Pat McCarran, Administrative Procedure Act, Legislative History, 217, 79th Congress 216 1944-1946 (1946) (emphasis added).

The present case involves the question of whether the Petitioner was denied the proper scope of judicial

review and more importantly whether the judicial review by the Federal Circuit met the Government's *minimum requirements* of fair administrative procedure. To that point, the Administrative Procedure Act, as codified in 5 U.S.C. § 706, states in defining the scope of judicial review that "[t]o the extent necessary to decision and when presented, *the reviewing court shall decide all relevant questions of law*...The reviewing court shall (1) compel agency action unlawfully withheld or unreasonably delayed." 5 U.S.C. § 706 (emphasis added). In this case, the Petitioner believes that the Federal Circuit would have had no choice but to reverse all grounds of rejection advanced by the Board if the Federal Circuit had simply addressed *all* relevant questions of law as required by § 706. Instead, the Federal Circuit vacated and remanded the Board's decision without addressing all relevant questions of law when both the facts on the record and fundamental issues of equity should have required reversal.

The Federal Circuit in this case not only abdicated, perhaps unintentionally, its duty to perform a *de novo* review of the legal question of obviousness under 35 U.S.C. § 103(a), but, more importantly, in doing so it denied the Petitioner a procedural safeguard, thereby delaying, and possibly materially affecting his property rights in the patent application at issue.

This case is of national importance because when a court fails to meet minimum standards of judicial review under the APA it removes an important check and balance mechanism put in place by Congress specifically for the purpose of protecting the rights of the individual and others affected by an agency's decision. The Petitioner in this case is not asking for

new procedure or a change in current procedure, but rather simply that the Federal Circuit follow the procedure and scope of review which is statutorily prescribed and which Congress intended when it enacted the APA. [4] Failure to meet statutory minimum standards of review further results in granting greater power to the Executive branch of Government through its agency and thereby weakens the Judiciary by removing the very check against the arbitrary exercise of agency powers which Congress expressly intended in passing the APA. *See* McCarran, *supra* at 217.

In the specific light of the present case, procedural delay in the the issuance of a new patent affects not only the Petitioner, but these types of delays have also been found to have significant overall economic impact. This Court, in the landmark case of *Graham v. John Deere*, 383 U.S. 1 (1966), recognized that the failure of the PTO to strictly adhere to the patent law as set forth by Congress (and by implication the patent law includes the APA under which the PTO operates) had resulted in significant procedural delay that took shape as a sizeable backlog in the PTO. The Court in 1966 stated that:

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[4] The Petitioner would note that early in the history of this nation James Madison recognized that "[t]he right to useful inventions, seems...to belong to the inventors [and that] [t]he public good fully coincides...with the claims of individuals." THE FEDERALIST NO. 43 (James Madison). Thus, in a very real way, the failure to provide proper review in a patent case can also be seen as implicating a denial of procedural due process in adjudication concerning a personal property interest.

> [w]hile we have focused attention on the appropriate standard to be applied by the courts, it must be remembered that the primary responsibility for sifting out unpatentable material lies in the Patent Office. To await litigation is, for all practical purposes, to debilitate the patent system. We have observed a notorious difference between the standards applied by the Patent Office and by the courts. While many reasons can be adduced to explain the discrepancy, one may well be the free rein often exercised by Examiners in their use of the concept of "invention." In this connection, we note that the Patent Office is confronted with a most difficult task. Almost 100,000 applications for patents are filed each year. Of these, about 50,000 are granted, and the backlog now runs well over 200,000. 1965 Annual Report of Commission of Patents 13-14. This is itself a compelling reason for the Commissioner to strictly adhere to the 1952 Act as interpreted here. This would, we believe, not only expedite disposition, but bring about a closer concurrence between administrative and judicial precedent.

Graham, 383 U.S. 1, 18-19 (1966).

Unfortunately procedural delay still exists in 2010 for many of the same reasons identified by this Court in 1966. Paul R. Michel, now former Chief Judge of the United States Court of Appeals for the Federal Circuit recently addressed the examiners of

the USPTO on the threat to our economy posed by procedural delay. He stated:

> Well, what is wrong with the present patent system? First, and foremost: delay. In some technologies it now takes 4-6 years even to get a patent. The product life-cycle may be shorter. For all technologies the average is three years... Even worse, because most applications must by law be published at 18 months, others, including foreign competitors, can pirate inventions for years before the patents issue, for until then patent owners have no rights. The patent system is failing primarily because the patent office is failing. In a word, it is dysfunctional. Over 700,000 applications sit unread in a warehouse in Alexandria, Virginia, often for years. Although 400,000 are under examination, their progress is far too slow. And every year almost 400,000 more are filed... Inexperienced examiners harm the system: they allow patent claims they should reject and reject ones they should allow, further increasing delays and costs. And the lack of quality assurance undermines the presumption of patent validity provided by law and the credibility of patents in the eyes of Congress.

Paul R. Michel, Chief Judge U.S. Court of Appeals for the Fed. Cir,, Address to USPTO Examiners (April, 2010), *available at* http://www.jptos.org/chief-judge-paul-michel-speech.html.

These procedural delays cost not only the patent applicant by prejudicing his or her prospective property rights through postponement, but also the economy through jobs and wealth. According to a recent study,[5] "[o]n a normalized basis patents are responsible for approximately one quarter (22.5%) of the market capitalization of the S&P 500." These backlogs may impose several types of costs both on users of the patent system and, through effects on incentives to innovate, on the wider economy. Increases in backlogs translate into longer pendency times (i.e. the time it takes for a patent application to be processed from filing to grant). Longer pendency time reduces the value of patents to applicants, and reduces incentives for innovation. The pendency delays in the USPTO have recently been estimated to cost the US economy $6.6 Billion per year.[6] Even this large cost excludes the largest cost: "any cost associated with the fact that growing pendency leads to a longer period of uncertainty relating to the scope of patent rights. This uncertainty may deter investment in productive areas by third parties, and was consid-

[5] James E. Malackowski, and Jonathan Barney, Patent Attribution to Equity Returns, January 5, 2009, pg 1, *available at* http://www.oceantomo.com/system/files/Patent_Attribution_to_Equity_Returns_1-6-09.pdf ("innovation is directly reflected in the market's measure of intangible assets and largely embodied in patents. Any attribution to patents specifically cannot be measured by a simple count. Stated directly, patents are the single most fundamental measure of innovation but only recently has the private sector developed sufficient metrics to support the inclusion of patent quality and value measurements as a relevant statistic")

[6] Economic Study on Patent Backlogs and a System of Mutual Recognition, Final Report To the Intellectual Property Office, 64 London Economics, January 2010, *available at* http://www.ipo.gov.uk/p-backlog-report.pdf

ered the most important cost of backlogs by several patent office representatives."[7]

Procedural delays caused by a reviewing court's failure to fully perform the minimum requirements of judicial review will not only compound the current pendency problems within the PTO but will remove a vital check on the arbitrary exercise of power by the PTO. The Petitioner reminds this Court that Congress has stated that judicial review under the APA "is of *utmost importance*, but it can be operative in relatively few cases because of the cost and general hazards of litigation." *See* McCarran, *supra* at 217. If the judiciary fails to perform a full judicial review and instead abdicates its responsibility to review *de novo all* relevant questions of law then the judicial review provided for by §706 of the APA will no longer be "indispensable" and its mere existence *will not* serve as a deterent to "preclude the arbitrary exercise of powers" as Congress had intended. *Id.*

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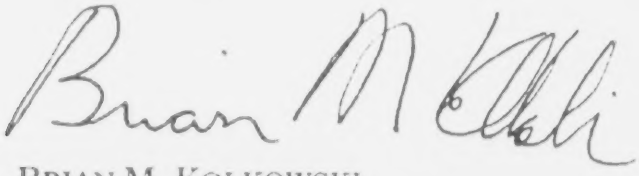
[7] *See supra* note 6.

CONCLUSION

An applicant for patent generally has substantive and procedural protections and an opportunity for review of his or her case at three points in the patent process: (1) before the examiner; (2) at the Board of Patent Appeals and Interferences; and (3) on appeal to the reviewing court. If, as in the present case, the applicant does not receive the "minimum requirements of fair administrative procedure," McCarran *supra*, at 217, at any one of these three checkpoints – both the applicant and the public will begin to lose faith in the United States patent system. For this as well as the other reasons set forth above, this petition for a writ of certiorari should be granted.

Respectfully submitted,



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APPENDIX A

NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

(Serial No. 10/259,203)

IN RE RAVI VAIYANATHAN

2009-1404

Appeal from the United States Patent and Trademark Office, Board of Patent Appeals and Interferences, No. 2008-2867.

Decided: May 19, 2010

BRIAN M. KOLKOWSKI, Orbital Research Inc., of Cleveland, Ohio, for appellant.

RAYMOND T. CHEN, Solicitor, Office of the Solicitor, United States Patent and Trademark Office, of Arlington, Virginia, for the Director of the United States Patent and Trademark Office. With him on the brief were BENJAMIN D.M. WOOD and NATHAN K. KELLEY, Associate Solicitors.

Before MICHEL, *Chief Judge*, NEWMAN AND DYK, *Circuit Judges*.

Opinion for the court filed by *Circuit Judge* NEWMAN.

Circuit Judge DYK concurs in the judgment.

NEWMAN, *Circuit Judge*.

Ravi Vaidyanathan ("the applicant") appeals the ruling of the Board of Patent Appeals and Interferences of the United States Patent and Trademark Office, affirming the examiner's rejection of claims 1–9 of application Serial No. 10/259,203 ("the '203 application"), on the ground of obviousness, 35 U.S.C. §103(a). The Board reversed the rejection of claims 10–11. *Ex parte Vaidyanathan*, No. 2008-2867 (B.P.A.I. March 11, 2009) ("*Board Opinion*").

For claims 1–9, we *vacate* the rejection and *remand* for further examination.

DISCUSSION

The '203 application relates to a guidance and control method for controlling munitions such as missiles or unmanned aircraft, wherein an autonomous reflex response is based on a neural network model of a biological response. The method is designed for the "endgame" stage of flight when the munition is very close to the target, at which stage the system guides and controls the munition by calculating trajectory commands using a neural network that is trained using a genetic algorithm; the neural network provides "high level" guidance commands to an autopilot, which converts those commands to signals that direct the actual movement of the munition. The system is described as achieving substantial gains in accuracy, as compared with prior systems.

The '203 specification acknowledges extensive existing knowledge concerning guided munitions, the use of autopilots in connection with these munitions, and the development of neural networks. The '203 invention contemplates that known technologies are

used to bring the munition within close range of the target, at which stage the neural network provides rapid-response trajectory commands for the final or endgame stage. The specification describes in mathematical detail a form of neural network that is modeled on the rapid neural response that is described as characteristic of the escape actions seen in cockroaches.

Claim 1, the broadest claim on appeal, is as follows:

> 1. A method of controlling a munition, vehicle or aircraft comprising the steps of:
>
> a) receiving information from sensors;
>
> b) processing the information with a neural net-work to obtain a desired trajectory for the munition, vehicle or aircraft to follow;
>
> c) inputting the desired trajectory and the information from internal sensor into an autopilot; and
>
> d) controlling the munition, vehicle or aircraft to fly the desired trajectory through the autopilot.

Claims 2–7 include additional limitations that are not argued separately in this appeal, although claim 3, which requires that the "neural network is trained using a genetic algorithm," is discussed. Claims 8 and 9 add the limitations that the neural network guides the munition, vehicle or aircraft "to avoid a target" (claim 8) or "to strike a target" (claim 9). Claims 10 and 11, which were allowed by the Board, add the limitations that the neural network only guides the munition "during the last less than about 1 second" before either target avoidance (claim 10) or

target strike (claim 11); these claims are not part of this appeal.

The Board affirmed the examiner's rejection of claims 1, 2, and 4–9 as obvious in view of the combination of two references, U.S. Patent No. 6,473,747 ("Biggers") and No. 5,435,503 ("Johnson"). Claim 3 was rejected in view of Biggers, Johnson, and U.S. Patent No. 6,449,603 ("Hunter"). The applicant argues that these rejections were based on a misunderstanding of the Biggers and Johnson references, and lacked sufficient findings by the Board. The applicant states that the Board misinterpreted claims 8 and 9, leading the Board to conclude erroneously that the additional limitations in these claims were taught by Biggers. The applicant complains that neither the examiner nor the Board made sufficient findings or adequately explained their reasoning. The PTO, through the Solicitor on this appeal, now seeks to substitute new reasoning for that supplied by the Board concerning how the asserted references should be interpreted. The applicant attempted to respond to these new arguments in his Reply Brief.

I

The obviousness inquiry is decided as a matter of law, based on four general factual inquiries as explained in *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966), and reaffirmed in *KSR International, Inc. v. Teleflex, Inc.*, 550 U.S. 398, 406–07 (2007). The patent examiner is responsible for marshalling the references whose teachings are most relevant to the claimed invention, and evaluating the claimed invention against these teachings, from the viewpoint of a person of ordinary skill in the field of invention. *See Graham, supra*; *In re Kubin*, 561 F.3d 1351, 1355

(Fed. Cir. 2009); *see generally In re Oetiker*, 977 F.2d 1443, 1445–47 (Fed. Cir. 1992).

The applicant challenges the Board's legal and factual analyses. He argues that the Board committed legal error by failing to follow the Court's requirement that the factual findings on which the legal conclusion of obviousness rests should be set forth explicitly. *See KSR*, 550 U.S. at 418 ("To facilitate review, this analysis should be made explicit."). *See also, In re Gartside*, 203 F.3d 1305, 1314 (Fed. Cir. 2000) ("We have expressly held that the Board's opinion must explicate its factual conclusions, enabling us to verify readily whether those conclusions are indeed supported by 'substantial evidence' contained within the record."); *In re Grasselli*, 713 F.2d 731, 739 (Fed. Cir. 1983) ("It is fundamental that rejections under 35 U.S.C. §103 must be based on evidence comprehended by the language of that section.").

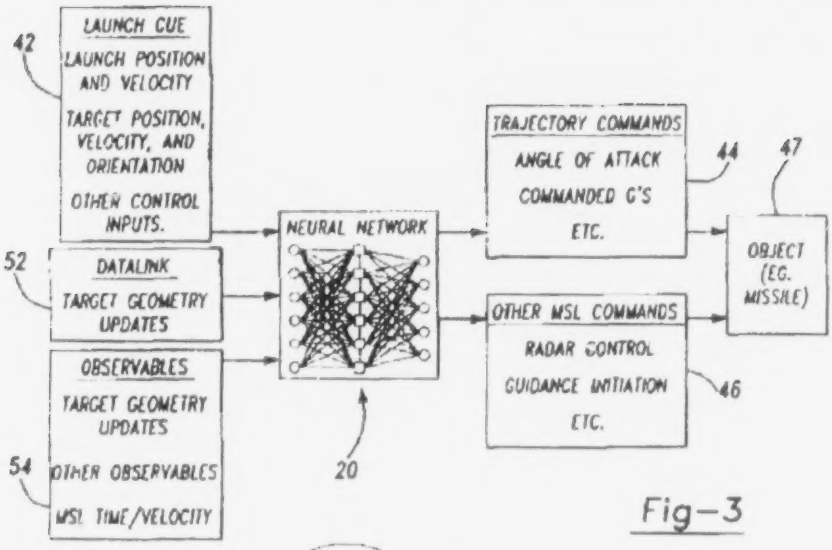
The applicant points to the Board's interpretation of the Biggers and Johnson references as examples of the Board's failure accurately to ascertain the differences between the prior art and the claimed invention, as required by *Graham*. He also states that the Board failed to establish, or even to address at all, the level of ordinary skill in the field of the invention, as required by *Graham*. He also states that the Board erred in its interpretation of claims 8 and 9, further undermining the conclusion of obviousness. He contends that these errors so infect the Board's legal analysis of obviousness that the rejections cannot stand.

A

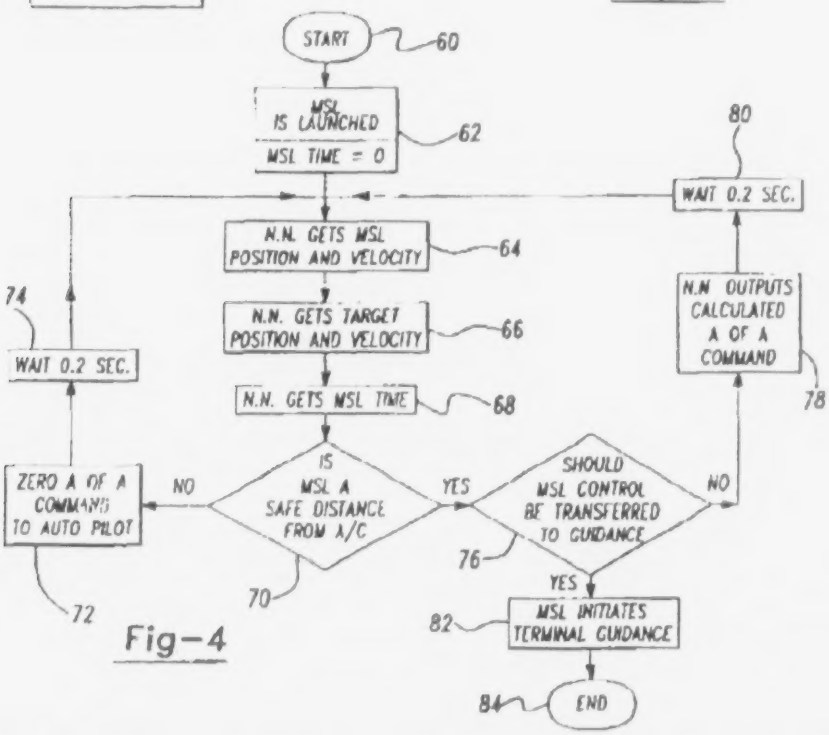
The applicant first argues that the Board's interpretation of the Biggers reference lacks support by substantial evidence. The applicant points out that the Board viewed Biggers differently than did the examiner, and that the PTO Solicitor has attempted yet a third interpretation on this appeal. We agree that the PTO has offered divergent views of what Biggers describes and means in relation to the '203 application.

Biggers is directed to the control of a guided missile using a neural network that processes information received from onboard sensors to determine desired trajectory commands. Unlike the '203 application's emphasis on the endgame stage of flight, Biggers uses the neural network at an intermediate stage of flight, and then switches to an independent guidance control system for the late-stage approach to the target. Figures 3 and 4 of Biggers illustrate the method: Figure 3 is a "data flow diagram" showing the information received by and produced by a neural network (20), and Figure 4 is a "flow-chart" depicting the sequence of steps by which the system operates:[1]

[1] In these figures "N.N." stands for neural network, "MSL" for missile, "A/C" for aircraft, and "A of A" for angle of attack.



Fig–3



Fig–4

As depicted in Figure 4, after missile launch (62) the neural network receives missile position and velocity information (64), target position and velocity information (66), and time elapsed since launch informa-

tion (68). At decision block (70) the system determines whether the missile is a safe distance from the aircraft; if it is not, a zero signal is sent to the autopilot (72) and the autopilot controls flight. If so, the neural network outputs a calculated angle-of-attack command that guides the missile (78), unless, at decision block (76), it is determined that the missile is close enough to its target to be transferred to a separate guidance system (82). In that case, the neural network ceases to provide commands and the guidance system controls the missile's flight. Thus the Biggers neural network controls flight only during the intermediate stage when the missile is a safe distance away from the launching aircraft but not yet within close range of its target.

The applicant especially criticizes the Board's third Finding of Fact ("FF3"), which relates to the interplay between the neural network component and the autopilot component of the Biggers system. The Board stated:

> FF3 Biggers teaches sending angle of attack commands to the auto pilot system of the missile. Biggers, col. 4, l. 66 to col. 5, l. 2. Although flow diagram box 44 in fig. 3 of Biggers is not explicitly discussed by Biggers, a person of ordinary skill in the art would understand that box to denote the auto pilot alluded to by Biggers.

Board Opinion at 6. This finding is relevant to step (c) of claim 1 of the '203 application, where the desired trajectory calculated by the neural network in step (b) is input into an autopilot. The Board found that the trajectory or "angle of attack" commands generated by the Biggers neural network are sent to

the autopilot for implementation, and thus that this aspect of step (c) is taught by Biggers. The Board did not discuss Biggers Figure 4, or the Biggers specification (apart from the cited sentence at col.4 l.66 to col.5 l.2, which makes no reference to the neural network), but cited box (44) of Figure 3 as providing implicit support for this aspect, although "not explicitly discussed." See FF3, *supra*. Box (44) shows "angle of attack" trajectory commands as output of the neural network, but makes no mention of an autopilot.

The Board thus recognized that the relay of trajectory commands from the neural network to the autopilot is not described explicitly in Biggers, but stated that "a person of ordinary skill in the art of missile guidance would understand that trajectory angle of attack commands, by whatever means they are produced, are transmitted to a missile auto pilot, which specifies angle changes to the missile necessary to maintain the velocity vector of the missile along the specified trajectory and transmits these changes to an alignment/control system to effect the changes." *Board Opinion* at 9–10. The Board cited no other evidence indicating the level of ordinary skill in the relevant art, or explaining why a person of ordinary skill would view this autopilot aspect as an implicit teaching of Biggers.

The applicant states that Biggers teaches the use of three independent, discrete elements or systems to guide the missile in different stages of flight. The applicant refers to the specific portions of the Biggers specification that he states describe these three distinct elements and stages: (1) an autopilot used only to maintain the initial trajectory after launch and until the missile is a safe distance from the aircraft

that launched it (Biggers, col. 4 l.66 to col. 5 l.2); (2) a neural network apparatus for taking over control of the trajectory of the missile after it is a safe distance from the aircraft until it reaches a non-final position (*id.* col. 4 ll.13–17; col. 6 ll.43–44); and (3) a terminal guidance system for guiding the missile from that non-final position to a final position (*id.* col. 4 ll. 15–17; col. 4 ll.35–38; col. 5 ll.14–17).

The applicant states that when it is understood that Biggers teaches these separate and independent systems for guiding the missile at different stages, it cannot reasonably be concluded that Biggers teaches that the neural network sends its trajectory commands to the autopilot. He states that Biggers only refers to the autopilot in connection with the initial stage, before the neural network begins to control flight. He argues that the Biggers specification never states that the neural network sends its commands to the autopilot, and that this path would be incompatible with the purpose of the Biggers invention. He states that Figure 3, cited by the Board, provides no support for the Board's interpretation, for it makes no mention of an autopilot, and box (44) represents information that is produced by the neural network rather than a separate autopilot component of the system. The applicant argues that the flowchart in Figure 4 clarifies the independent operation of the autopilot and the neural network at different tempo ral stages. He states that Figure 4 shows that the Biggers autopilot controls flight only in the initial stage, when the missile is not yet a safe distance from the launching aircraft, and that the provision of "zero A of A command" during this stage, at step (72), indicates that the autopilot does not guide flight based on information received from the neural net-

work. In contrast, Figure 4 shows that the neural network calculates and outputs angle of attack commands in the intermediate stage when it guides flight, as indicated in step (78).

The PTO Solicitor on this appeal simply states that "substantial evidence supports the Board's finding that block 44 of Figure 3 denotes the missile's autopilot system." PTO Brief at 18. This statement is not tied to any description within Figure 3, or any language in the specification, or any other source of "substantial evidence." Apparently recognizing this gap, the Solicitor also presents an explanation of Biggers that differs from that provided by the Board. The Solicitor now states that Biggers' Figure 4 provides support for finding that Biggers teaches the input of trajectory information produced by the neural network into an autopilot, which then controls the missile to fly the desired trajectory. Contradicting the applicant's explanation of Biggers, the PTO reasons that the "zero A of A command" sent to the autopilot in step (72) is itself a "trajectory command" provided by the neural network in the sense required by the applicant's claim 1 step (c). However, neither the Board nor the Examiner made such findings regarding step (72), and the Board's opinion states that the Board found Biggers' autopilot teaching not in Figure 4, but in block (44) of Figure 3. The PTO Solicitor now argues, for the first time, that Figure 4 is sufficient to show that commands from the neural network are input into the autopilot in at least one phase of the Biggers method.

The PTO also argues that the Johnson reference describes an autopilot that receives and implements guidance commands from a guidance function, and that this is evidence of how traditional autopilots

were known to function. The Solicitor states, citing the "Background" discussion in the '203 specification, that autopilots have operated in this way for over sixty years, since the Proportional Navigation ("Pro-Nav") algorithm for terminal stage missile guidance was introduced publicly in 1948. The Solicitor states that while the Biggers reference lacks detail in its description of the autopilot, nothing in Biggers suggests that these known autopiloting techniques were set aside, or that the autopilot plays no role in effectuating the trajectory commands calculated by the Biggers neural network. The Solicitor argues: "Because the focus of Biggers is on what generates the guidance commands—the neural network trajectory controller—and not on how a missile converts these commands into actual course changes, it is not particularly surprising that Biggers does not discuss the autopilot in greater detail." PTO Brief at 21.

The applicant addresses these new PTO arguments in his Reply Brief. He states that Figure 4 of Biggers and the general background knowledge of autopilots do not show what the Solicitor states is shown. The applicant points out that while the Solicitor states that in Biggers "the neural network sends a zero angle of attack to the autopilot" in step (72), nothing in either Figure 4 or the accompanying description states that it is the neural network that sends this zero angle of attack. Biggers describes this step of Figure 4 as follows: "If [the missile] is not a safe distance, then block 72 is processed wherein a zero angle of attack command is sent to the auto pilot system of the missile, and subsequently block 74 is executed wherein the neural network waits a predetermined amount of time . . . ." Biggers, col.4 l.67 – col.5 l.4. The applicant contends that this description

shows that the neural network does not participate in guiding flight during the initial stage. He argues that in contrast, step (78) expressly shows the role played by the neural network when it participates in flight guidance. He states that there is no evidence supporting the Solicitor's new argument that the neural network's participation is inherent at step (72).

The Solicitor states that the applicant has not explained where else the zero angle of attack in step (72) could come from, but the applicant responds that he does not bear the burden of proving what Biggers teaches. The applicant points to the conflicting views of the Examiner, the Board, and now the PTO Solicitor as indications that the Biggers reference does not present the clarity of disclosure that the Solicitor now suggests. For example, the Examiner's Answer stated that "Biggers . . . explicitly teaches that the path from the non-final position to the final position should be calculated by the 'neural network apparatus' and should be *provided* (*or inputted*) from the neural network apparatus to the guidance system." (Emphasis in original.) The Board contradicted the Examiner, and stated "We find no teaching in Biggers that the trajectory data produced by the neural network are sent to the missile guidance system." *Board Opinion* at 6. The Board instead relied on FF3, which also departed from the Examiner's fact finding, for the Examiner had concluded that the "guidance system" of Biggers "should be reasonably understood as an autopilot system," whereas the Board viewed the autopilot and guidance systems of Biggers as separate functionalities. The PTO Solicitor now retreats from the Board's finding that Biggers teaches that the trajectory commands produced by the neural

network are input into a separate autopilot function; the Solicitor instead argues that autopilot functions were well known, and that neither Biggers nor the claimed invention altered the basic understanding of autopilot functions.

Thus the PTO has now provided a third explanation of why Biggers teaches the input of trajectory commands from the neural network into the autopilot—one to which the applicant had no opportunity to respond or provide rebuttal evidence before the Board, although he has attempted to respond in his Reply Brief on this appeal. This third retooling of the PTO position, without additional development of the record, casts serious doubt upon the sufficiency of the support for any set of findings relating to the teachings of Biggers. Although the Solicitor argues that the court must defer to the PTO's latest position, the agency's contradictory findings of technological facts based on shifting perceptions of the prior art impeach the deference normally owed to administrative findings of fact. *See Universal Camera Corp. v. NLRB*, 340 U.S. 474, 496 (1951) ("evidence supporting a conclusion may be less substantial when an impartial, experienced examiner who has observed the witnesses and lived with the case has drawn conclusions different from the Board's than when he has reached the same conclusion").

Further, the PTO's new explanation cannot of itself provide substantial evidence for the Board's findings, for our review is constrained by the facts that were developed during the Board proceeding. While the PTO Solicitor's argument is new as to what portion of Biggers provides support for the Board's findings, we have occasionally permitted the Solicitor to support the Board, on appeal to the court, by refer-

ence to additional portions of the references of record, provided that the applicant has had a fair opportunity to respond. *See In re Hedges*, 783 F.2d 1038, 1039 (Fed. Cir. 1986); *see also In re Wesslau*, 353 F.2d 238, 241 (CCPA 1965) (prior art reference should be considered in its entirety for what it fairly suggests to one skilled in the art). Nonetheless, the reviewing court must review the decision of the Board on the basis of the Board's findings, rather than on "post hoc rationalizations for agency action." *In re Hounsfield*, 699 F.2d 1320, 1324 (Fed. Cir. 1983) (quoting *Burlington Truck Lines, Inc. v. United States*, 371 U.S. 156, 168 (1962)).

We conclude, on the evidence and arguments presented, that the Board did not persuasively explain how a person of ordinary skill in the art would conclude that Biggers taught that the trajectory commands produced by the neural network are to be input into a separate autopilot function. The PTO's shifting positions do not assist in appellate review. *See In re Thrift*, 298 F.3d 1357, 1366 (Fed. Cir. 2002) (citing *SEC v. Chenery Corp.*, 332 U.S. 194, 196 (1947)) ("a reviewing court, in dealing with a determination or judgment which an administrative agency alone is authorized to make, must judge the propriety of such action solely by the grounds invoked by the agency"). However, we are not prepared to hold that all three of the PTO's conflicting interpretations of Big-gers and other teachings with respect to autopilot func-tionality are incorrect. We remand for further development of the record, and full reconsideration by the agency.

B

The applicant next argues that the Board erred as a matter of law by failing to make any findings at all as to some aspects of the obviousness analysis. He stresses that the Board did not establish the level of ordinary skill in the field of the invention, a necessary *Graham* factor. He acknowledges that "the absence of specific findings on the level of skill in the art does not give rise to reversible error 'where the prior art itself reflects an appropriate level and a need for testimony is not shown,'" *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (quoting *Litton Industrial Prods., Inc. v. Solid State Systems Corp.*, 775 F.2d 158, 163 (Fed Cir. 1985)), but he complains that the Board made repeated reference to what a "person of ordinary skill" would have understood or inferred, without ever explaining that level of ordinary skill or citing evidence to support these findings. As this court has observed, "Skill in the art does not act as a bridge over gaps in the substantive presentation of an obviousness case, but instead supplies an important guarantee of objectivity in the process." *Id.*

The PTO responds that the Board is not required to make express findings as to the level of ordinary skill in the field of the invention. The PTO states that reversal on this basis is appropriate only when the Board's failure to make an express finding on this factor reasonably may have distorted the ultimate conclusion on obviousness. *See Custom Accessories, Inc. v. Jeffrey-Allan Industries, Inc.*, 807 F.2d 955, 963 (Fed. Cir. 1986) (vacating obviousness holding and remanding because the district court's failure to make specific findings on the level of ordinary skill, along with failure to address other *Graham* fac-

tors, suggested that the court had not properly applied the *Graham* analysis). The PTO argues that the applicant "has not attempted to show how the lack of an express finding influenced the Board's conclusion on obviousness, or that the prior art in the record is inadequate to demonstrate the appropriate level of skill." PTO Brief at 28.

The applicant replies that his argument is not simply that the Board failed to make express findings as to the level of skill; he states that the issue is uniquely relevant because the examiner's statements apparently reflect personal experience in the field of the invention, but are unaccompanied by explanation or reasoning. He states that the Board, like the examiner, made conclusory statements that it would have been obvious to a person of ordinary skill to select and combine certain parts of certain references; the Board's analysis of this aspect reads:

> To combine the feature of a neural network for determining the optimal trajectory as taught by Biggers with the missile guidance system of Johnson to attain the advantages of each would have been obvious to a person of ordinary skill in the art, as this would involve nothing more than the predictable use of prior art elements according to their established functions.

Board Opinion at 10. The applicant argues that to support this conclusion it is necessary to explain how the knowledge and competence of the ordinary skilled person in this field would have led to this combination of previously uncombined elements.

We agree with the Solicitor that an explicit statement of the level of ordinary skill is not always

necessary in evaluating the obviousness of a new technologic advance. But whether or not stated explicitly, the perspective of a person of ordinary skill must frame the obviousness inquiry, and assertions of what such a person of ordinary skill would have found to be obvious require sufficient explanation to permit meaningful appellate review. In this case, not only the Board but also the examiner announced their conclusions of obviousness without providing any evidentiary support or reasoning for why a person of ordinary skill in the field of the invention would have deemed it obvious to select and combine various steps from different references, in the manner of the applicant. This court explained in *In re Zurko*, 258 F.3d 1379 (Fed. Cir. 2001), that the entry of the PTO into the deferential review of the Administrative Procedure Act requires the agency to provide support for its findings:

> With respect to core factual findings in a determination of patentability, . . . the Board cannot simply reach conclusions based on its own understanding or experience—or on its assessment of what would be basic knowledge or common sense. Rather, the Board must point to some concrete evidence in the record in support of these findings. To hold otherwise would render the process of appellate review for substantial evidence on the record a meaningless exercise.

Id. at 1386.

The PTO Solicitor argues that the Court in *KSR* held that a combination of elements from different prior art references is likely to be unpatentable if it would involve nothing more than "the predictable use

of prior art elements according to their established functions," *KSR*, 550 U.S. at 417, and that the Board applied this reasoning to the combination of Biggers and Johnson. *KSR* also clarified that recourse to "common sense," viewed through the perspective of a person of ordinary skill, is not barred in the obviousness inquiry. As the applicant states, while *KSR* relaxed some of the formalism of earlier decisions requiring a "teaching, suggestion, or motivation" to combine prior art references, it did not remove the need to anchor the analysis in explanation of how a person of ordinary skill would select and apply the teachings of the references. *See, e.g., id.* at 417 ("If a person of ordinary skill can implement a predictable variation, §103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.").

The applicant complains that the Board simply reasoned from the hindsight knowledge of his successful invention; he stresses that, unlike the facts in KSR, the various steps that he combined were not known to be combinable, and the result of increased precision in missile guidance to the target was not previously known or predictable.

Obviousness is determined as a matter of foresight, not hindsight. *See id.* at 421 (citing *Graham*, 383 U.S. at 36). KSR did not free the PTO's examination process from explaining its reasoning. In making an obviousness rejection, the examiner should not rely on conclusory statements that a particular feature of the invention would have been obvious or was

well known. Instead, the examiner should elaborate, discussing the evidence or reasoning that leads the examiner to such a conclusion. Generally, the examiner cites prior art references to demonstrate the state of knowledge. *See* 37 C.F.R. §1.104(c)(2) ("In rejecting claims for want of novelty or obviousness, the examiner must cite the best references at his or her command."); Manual of Patent Examining Procedure (MPEP) §706.02 (8th ed., rev. July 2008) ("Prior art rejections should ordinarily be confined strictly to the best available art. [citing exceptions] Such rejections should be backed up by the best other art rejections available."). If it is not possible for the examiner to pro-vide this type of information, the examiner might choose instead to provide an affidavit detailing the examiner's own personal knowledge (as a person approximating one of ordinary skill in the art) of the technology in question. *See* 37 C.F.R. §1.104(d)(2) ("When a rejection in an application is based on facts within the personal knowledge of an employee of the Office, the data shall be as specific as possible, and the reference must be supported, when called for by the applicant, by the affidavit of such employee, and such affidavit shall be subject to contradiction or explanation by the affidavits of the applicant and other persons."). Where, as here, prior art references are cited to support an obviousness rejection, the references themselves need not in every case provide a "specific hint or suggestion" of the alteration needed to arrive at the claimed invention; the examiner's analysis "may include recourse to logic, judgment, and common sense available to a person of ordinary skill that do not necessarily require explication in any reference or expert opinion." *Perfect Web Techs. v. InfoUSA, Inc.*, 587 F.3d 1324,

1329 (Fed. Cir. 2009). In these cases the examiner should at least explain the logic or common sense that leads the examiner to believe the claim would have been obvious. Anything less than this results in a record that is insulated from meaningful appellate review. *Zurko*, 258 F.3d at 1386. If the examiner is able to render a claim obvious simply by saying it is so, neither the Board nor this court is capable of reviewing that determination. *See KSR*, 550 U.S. at 418, citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.").

Because there is insufficient elaboration of the examiner's or the Board's reasoning in this record, we vacate the Board's rejection of claims 1–7. We remand for redetermination of the question of obviousness. On remand, the PTO should determine obviousness based on evidence of record or on the examiner's detailed and articulated reasoning. If there is neither record evidence nor detailed examiner reasoning, the Board should not conclude that Vaidyanathan's claims are obvious.

II

The Board addressed claims 8 and 9 separately, with claim 9 agreed to be representative. Claim 9, in multiple dependent form, may be rewritten in independent form as follows:

> 9. [A method of controlling a munition, vehicle or aircraft comprising the steps of:
>
> a) receiving information from sensors;

b) processing the information with a neural network to obtain a desired trajectory for the munition, vehicle or aircraft to follow;

c) inputting the desired trajectory and the information from internal sensor into an autopilot; and

d) controlling the munition, vehicle or aircraft to fly the desired trajectory through the autopilot;

wherein the information is received from external and internal sensors;

wherein the external sensor information is information related to a target position;

wherein the neural network determines a desired trajectory for the munition, vehicle or aircraft; and]

wherein the neural network is guiding the munition, vehicle or aircraft to strike a target.

The Board found that "Biggers does not teach using the neural network to guide the missile all the way to intercept." However, the Board concluded that the "to strike a target" limitation does not adequately distinguish claim 9 from Biggers because it does not require that the neural network guide the missile or munition all the way to "intercept," but instead merely requires that the neural network guide the munition "to strike a target." The Board viewed the words "to strike a target" as a recitation of intended purpose, rather than a step of a claimed method. On this view, the Board held that because the purpose in Biggers is also a target strike, Biggers teaches this limitation and thus describes the same method as claim 9. The Board stated: "In guiding the missile

toward the target to the optimum point in space where the missile guidance system can take control and guide the missile 47 to intercept the target (FF1), the neural network in the method taught by Biggers guides the missile to strike a target." *Board Opinion* at 11.

The applicant argues that claim 9, when properly construed in light of the specification, requires actual participation by the neural network until the point of intercept, unlike the Biggers method. He argues that the Board misconstrued the "to strike a target" limitation of claim 9, and thereby misapplied Biggers. The applicant states that the '203 application describes for the first time the use of a neural network in connection with the final stage of flight leading to intercept, whereas Biggers describes the use of a neural network only at an intermediate stage, to be replaced by a different terminal guidance system before intercept.

The PTO Solicitor responds that the broadest reason-able claim interpretation that is supported by the specification is adopted during examination, for the claims can readily be amended during examination, to impart precision if needed. We agree with this protocol as an examination expedient, for its purpose is to aid in sharpening the claims in order to avoid ambiguity or uncertainty in the issued patent. *See e.g.*, *In re Skvorecz*, 580 F.3d 1262, 1267 (Fed. Cir. 2009); *In re Buszard*, 504 F.3d 1364, 1366–67 (Fed. Cir. 2007); *In re Prater*, 415 F.2d 1393, 1396 (CCPA 1969). However, the PTO's "broadest" interpretation must be reasonable, and must be in conformity with the invention as described in the specification.

The Board's interpretation of claim 9 finds no support in the '203 specification, and is not a reasonable interpretation under the rules of claim construction. The description in the specification consistently indicates that the neural network guides the munition all the way intercept. The '203 specification uses the word "strike" synonymously with "intercept," foreclosing the divergent meanings the Board seeks to attach to these terms. The Board's rejection of claims 8 and 9 was based on an incorrect interpretation of these claims. That rejection is vacated and remanded for reconsideration under the correct interpretation of the claims, and in further view of the issues with respect to obviousness as discussed in connection with claims 1–7.

III

Both sides have raised additional arguments, for ex-ample with respect to the impact of the Johnson reference on the "sensor" aspect of step 1(c). In view of our remand for further prosecution of claims 1–9, we need not reach the additional issues, for none appears to be dispositive of either allowance or rejection.[2] They may be considered on remand if relevant to the issues.

VACATED AND REMANDED

DYK, *Circuit Judge*, concurs in the judgment.

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[2] In its Statement of Facts, the PTO points out that the appealed claims do not limit the '203 application's invention to a specific use of a neural network based on the specific reflex response that is the primary matter described in the specification, and thus suggests that the appealed claims are too broadly drawn to distinguish the invention from the combination of Biggers and Johnson. This aspect may warrant attention on remand.

APPENDIX B

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte RAVI VAIDYANATHAN

Appeal 2008-2867
Application 10/259,203
Technology Center 3600

Decided:[3] March 11, 2009

Before: WILLIAM F. PATE, III, JENNIFER D. BAHR, and STEFAN STAICOVICI, *Administrative Patent Judges.*

BAHR, *Administrative Patent Judge.*

DECISION ON APPEAL

[3] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

STATEMENT OF THE CASE

Ravi Vaidyanathan (Appellant) appeals under 35 U.S.C. § 134 from the Examiner's decision rejecting claims 1–11. Claims 12–20 have been canceled. We have jurisdiction over this appeal under 35 U.S.C. § 6 (2002).

The Invention

Appellant's claimed invention is directed to a method of using an autonomous reflex of a munition, vehicle or aircraft to avoid or ensure collision with a target based upon a neural network model of a biological response wherein the system is trained using genetic algorithms. Specification 1:10–13.

Claim 1, reproduced below, is the only independent claim involved in this appeal.

> 1. A method of controlling a munition, vehicle or aircraft comprising the steps of:
>
> a) receiving information from sensors;
>
> b) processing the information with a neural network to obtain a desired trajectory for the munition, vehicle or aircraft to follow;
>
> c) inputing [*sic*: inputting] the desired trajectory and the information from internal sensor[1] into an autopilot, and

[1] The language "*internal* sensor" lacks strict antecedent basis in the claim. For purposes of this appeal, we understand the recited step of inputting "information from internal sensor" to incorporate a further limitation to the step of receiving information to the effect that the information is received from an internal sensor. In the event of further prosecution of the subject matter of claim 1, Appellant and the Examiner should consider

d) controlling the munition, vehicle or aircraft to fly the desired trajectory through the autopilot.

The Rejections

Appellant seeks review of the Examiner's rejections under 35 U.S.C. § 103(a) of claims 1, 2, and 4-11 as being unpatentable over Biggers (US 6,473,747 B1, issued Oct. 29, 2002) and Johnson (US 5,435,503, issued Jul. 25, 1995) and claim 3 as being unpatentable over Biggers, Johnson, and Hunter (US 6,449,603 B1, issued Sep. 10, 2002).

SUMMARY OF DECISION

We AFFIRM-IN-PART.

ISSUES

Appellant argued that neither Biggers nor Johnson describes a method including the step of inputting the desired trajectory and the information from an internal sensor into an autopilot, and that, in fact, Biggers actually teaches away from inputting information obtained from a neural network into an autopilot. Appeal Br. 3–4.

Appellant also argued that Biggers and Johnson do not teach a neural network guiding a missile to avoid or strike a target, as called for in claims 8 and 9. Appeal Br. 6. Moreover, Appellant argued that Biggers and Johnson do not teach a neural network that only guides the munition, vehicle, or aircraft

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taking appropriate action to amend claim 1 to explicitly include such a limitation.

during the last less than about 1 second before target avoidance or before target strike, as called for in claims 10 and 11. Appeal Br. 7.

Additionally, Appellant argued that because the neural network discussed by Hunter is related to the field of artificial intelligence and machine learning, not aircraft, munition, or vehicle control, Biggers, Johnson, and Hunter do not teach using a genetic algorithm trained neural network for inputting into an autopilot a trajectory for controlling the aircraft, munition, or vehicle. Appeal Br. 8; Reply Br. 6.

In contesting the rejection of claims 1, 2 and 4–11 as being unpatentable over Biggers and Johnson, Appellant has argued claims 1, 2, and 4–7 as a group; claims 8 and 9 as a group, and claims 10 and 11 as a group. Therefore, in accordance with 37 C.F.R. § 41.37(c)(1)(vii) (2008), we select claims 1 and 9 as representative claims, with claims 2 and 4-7 standing or falling with claim 1 and claim 8 standing or falling with claim 9. We address the rejection of claims 10 and 11 and the rejection of claim 3 as being unpatentable over Biggers, Johnson, and Hunter separately.

In light of the above, the issues before us are:

(1) Has Appellant demonstrated the Examiner erred in determining a method of controlling a munition as recited in claim 1, including, in particular, the step of inputting the desired trajectory and the information from an internal sensor into an autopilot, would have been obvious to a person of ordinary skill in the art in view of the combined teachings of Biggers and Johnson?

(2) Has Appellant demonstrated the Examiner erred in determining that the combination of

Biggers and Johnson renders obvious the subject matter of claim 9, more particularly, wherein the neural network guides the munition, vehicle, or aircraft to strike a target?

(3) Has Appellant demonstrated the Examiner erred in determining that the combination of Biggers and Johnson renders obvious the neural network only guiding the munition, vehicle, or aircraft during the last less than about 1 second before target avoidance or target strike, as called for in claims 10 and 11 ?

(4) Has Appellant demonstrated the Examiner erred in determining it would have been obvious in view of the combined teachings of Biggers, Johnson, and Hunter to train the neural network of the munition control system using a genetic algorithm, as required in claim 3?

FACTS PERTINENT TO THE ISSUES

FF1 Biggers discloses using a neural network 20 for accepting inputs, including, *inter alia*, missile observables 54, which are real-time data, such as missile position and velocity and target position and velocity, from sensors onboard the missile 47 (internal sensors), and for outputting calculated angle of attack commands for the optimum trajectory (desired trajectory) to command the missile 47 to the optimum point in space where the missile guidance system can take control and guide the missile 47 to intercept. Biggers, col. 2, ll. 22–33; col. 3, ll. 7–14 and 41–56; col. 4, ll. 12–16, and 24–28; figs. 1 and 3.

FF2 Biggers teaches having the neural network guide or command the missile 47 only to the optimum point in space, and not all the way to intercept. The missile's guidance system, which is independent of the neural network (Biggers, col. 7, ll. 5–6), takes control and guides the missile from the optimum point in space to intercept. We find no teaching in Biggers that the trajectory data produced by the neural network are sent to the missile guidance system.

FF3 Biggers teaches sending angle of attack commands to the auto pilot system of the missile. Biggers, col. 4, l. 66 to col. 5, l. 2. Although flow diagram box 44 in fig. 3 of Biggers is not explicitly discussed by Biggers, a person of ordinary skill in the art would understand that box to denote the auto pilot alluded to by Biggers.

FF4 Biggers does not explicitly teach sending data from internal sensors to the auto pilot.

FF5 Biggers teaches training the neural network. Biggers, col. 4, ll. 39–46.

FF6 Johnson teaches that a missile guidance function 5 1 computes guidance commands, including angle of attack and bank angle commands, in order to approximate an optimal trajectory. Johnson, col. 7, ll. 59–61 ; col. 11, ll. 5–7 and 50–52. A missile autopilot 49 receives the guidance commands and specifies changes to the bank angle and angle of attack of the missile to maintain the velocity vector of the missile 20 along the specified trajectory and transmits these changes to an alignment func-

tion 48, which operates the attitude control system 23 or aerodynamic maneuvering system 24 of the missile to change the bank angle and angle of attack of the missile in accordance with the commands from the autopilot 49. Johnson, col. 10, l. 67 to col. 11, l. 2; col. 11, ll. 55–64. The autopilot 49 receives position and angular orientation information about the missile from the missile's inertial measurement unit (IMU) 22 (an internal sensor) via the navigation function 50. Johnson, col. 9, ll. 34-42; col. 11, ll. 2–4; fig. 4.

FF7 Hunter teaches a system and method for combining multiple learning agents, such as a neural network method-based agent and a genetic algorithm method-based agent, to produce a more accurate prediction method. Hunter, col. 1, ll. 11–15. According to the method, Hunter provides at least two of the learning agents, trains the learning agents on a set of training data so that each learning agent produces a prediction method, extracts feature combinations from the trained learning agents for use in future input presentations, and creates the next generation of agents. Hunter, col. 5, l. 55 to col. 6, l. 26; col. 7, l. 38 to col. 8, l. 48. The creation of the next generation of agents is a minor variant on traditional genetic algorithms. Hunter, col. 7, ll. 61–62.

FF8 Based on our findings with respect to Hunter (FF7), Hunter shows that it was known at the time of Appellant's invention to train a neural network using a genetic algorithm.

FF9 Appellant conceded that "Hunter does teach using a genetic algorithm for training a neural network." Appeal Br. 8.

FF10 Hunter does not specifically teach using a genetic algorithm for training a neural network used to guide a missile.

PRINCIPLES OF LAW

While there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness, "the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR Int'l. Co. v. Teleflex Inc.*, 550 U.S. 398, ____, 127 S. Ct. 1727, 1741 (2007).

> When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

Id. at ____, 127 S. Ct. at 1740. We must ask whether the improvement is more than the predictable use of prior art elements according to their established functions. *Id.*

"[W]hen the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious." *Id.* (citing *United States v. Adams*, 383 U.S. 39, 51–52 (1966)).

> A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. The degree of teaching away will of course depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant.

In re Gurley, 27 F.3d 551, 552–53 (Fed. Cir. 1994) (citations omitted).

ANALYSIS

Issue (1)

Appellant's position that Biggers teaches away from inputting the desired trajectory from the neural network into an autopilot appears to be based on a misapprehension that Biggers' "missile guidance system" is the autopilot. Guidance functions and autopilots have two distinct meanings within the art of missile guidance and control. Specifically, a guidance function determines angle of attack commands indicating a desired or optimum trajectory for the missile, while a missile autopilot receives the guidance commands and specifies changes to the angle of attack of

the missile to maintain the velocity vector of the missile along the specified trajectory commanded by the guidance function, and transmits these changes to an alignment function, which operates the attitude control system or aerodynamic maneuvering system of the missile to change the angle of attack of the missile in accordance with the commands from the autopilot. *See* FF6. While the neural network and missile guidance system of Biggers are independent from one another, and we find no teaching in Biggers of inputting the trajectory commands output from the neural network to the missile guidance system (FF2), Biggers' neural network does not guide or command the missile by magic. Rather, Biggers teaches sending angle of attack commands to the auto pilot system of the missile. FF3. Indeed, a person of ordinary skill in the art of missile guidance would understand that trajectory angle of attack commands, by whatever means they are produced, are transmitted to a missile auto pilot, which specifies angle changes to the missile necessary to maintain the velocity vector of the missile along the specified trajectory and transmits these changes to an alignment/control system to effect the changes. *See* FF6. For the above reasons, Biggers does not teach away from inputting information obtained from a neural network into an autopilot, as Appellant contends. In fact, the combined teachings of Biggers and Johnson would have suggested to a person of ordinary skill in the art that Biggers inputs the trajectory angle of attack commands to the autopilot, which then calculates the angle changes necessary to follow the trajectory and transmits angle change commands to an alignment/control system to effect those changes.

Biggers also teaches the neural network receiving information from internal sensors. FF1. Biggers does not explicitly teach sending data from internal sensors to the auto pilot. FF4.

Johnson teaches a missile guidance system employing an autopilot that receives position and angular orientation information about the missile from the missile's on-board (internal) sensors. FF6. To combine the feature of a neural network for determining the optimal trajectory as taught by Biggers with the missile guidance system of Johnson to attain the advantages of each would have been obvious to a person of ordinary skill in the art, as this would involve nothing more than the predictable use of prior art elements according to their established functions.

In light of the above, Appellant's arguments do not persuade us the Examiner erred in rejecting claim 1, or claims 2 and 4–7, which stand or fall with claim 1, as being unpatentable over Biggers and Johnson.

Issue (2)

We agree with Appellant (see Appeal Br. 7) that Biggers does not teach using the neural network to guide the missile all the way to intercept. FF2. Claim 9, however, does not require that the neural network guide the munition all the way to intercept. Rather, claim 9 merely requires that the neural network guide the munition to strike a target. In guiding the missile toward the target to the optimum point in space where the missile guidance system can take control and guide the missile 47 to intercept the target (FF1), the neural network in the method taught by Biggers guides the missile to strike a target.

Therefore, Appellant's argument does not persuade us the Examiner erred in rejecting claim 9, or claim 8, which stands or falls with claim 9, as being unpatentable over Biggers and Johnson.

Issue (3)

Claims 10 and 11 require that the neural network only guide the munition during the last less than about 1 second before target avoidance or target strike. Biggers does not teach this. Specifically, Biggers teaches having the neural network guide or command the missile 47 only to the optimum point in space, and not all the way to intercept. FF2. The Examiner does not rely on Johnson for any teaching that would remedy this deficiency in Biggers. Therefore, Appellant's argument persuades us the Examiner erred in rejecting claims 10 and 11 as being unpatentable over Biggers and Johnson.

Issue (4)

We find that Hunter shows that it was known at the time of Appellant's invention to train a neural network using a genetic algorithm. FF8. Moreover, Appellant conceded that this is the case. FF9. Hunter teaches using the two or more learning agents, such as a neural network and a genetic algorithm, in training the learning agents to produce a more accurate prediction method. FF7. Hunter does not specifically teach using a genetic algorithm for training a neural network used to guide a missile. FF10. Nevertheless, a person of ordinary skill in the art would have appreciated that using a genetic algorithm to train the neural network of Biggers for use in guiding a missile would improve the missile guidance system of Biggers and Johnson in the same manner as taught by Hunter, namely, by producing a more

accurate prediction method. Moreover, Appellant has not argued, much less shown, that using a genetic algorithm to train a neural network, in the manner taught by Hunter, for use in a missile guidance system would have been beyond the technical grasp of a person of ordinary skill in the art or produced unexpected results. For the above reasons, Appellant's argument does not persuade us the Examiner erred in rejecting claim 3 as being unpatentable over Biggers, Johnson, and Hunter.

CONCLUSIONS OF LAW

(1) Appellant has not demonstrated the Examiner erred in determining a method of controlling a munition as recited in claim 1, including, in particular, the step of inputting the desired trajectory and the information from an internal sensor into an autopilot, would have been obvious to a person of ordinary skill in the art in view of the combined teachings of Biggers and Johnson.

(2) Appellant not demonstrated the Examiner erred in determining that the combination of Biggers and Johnson renders obvious the subject matter of claim 9, more particularly, wherein the neural network guides the munition, vehicle, or aircraft to strike a target.

(3) Appellant has demonstrated the Examiner erred in determining that the combination of Biggers and Johnson renders obvious the neural network only guiding the munition, vehicle, or aircraft during the last less than about 1 second before target avoidance or target strike, as called for in claims 10 and 11.

(4) Appellant has not demonstrated the Examiner erred in determining it would have been obvious in view of the combined teachings of Biggers, Johnson, and Hunter to train the neural network of the munition control system using a genetic algorithm, as required in claim 3.

DECISION

The Examiner's decision is affirmed as to claims 1–9 and reversed as to claims 10 and 11.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv) (2007).

AFFIRMED-IN-PART

hh

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APPENDIX C

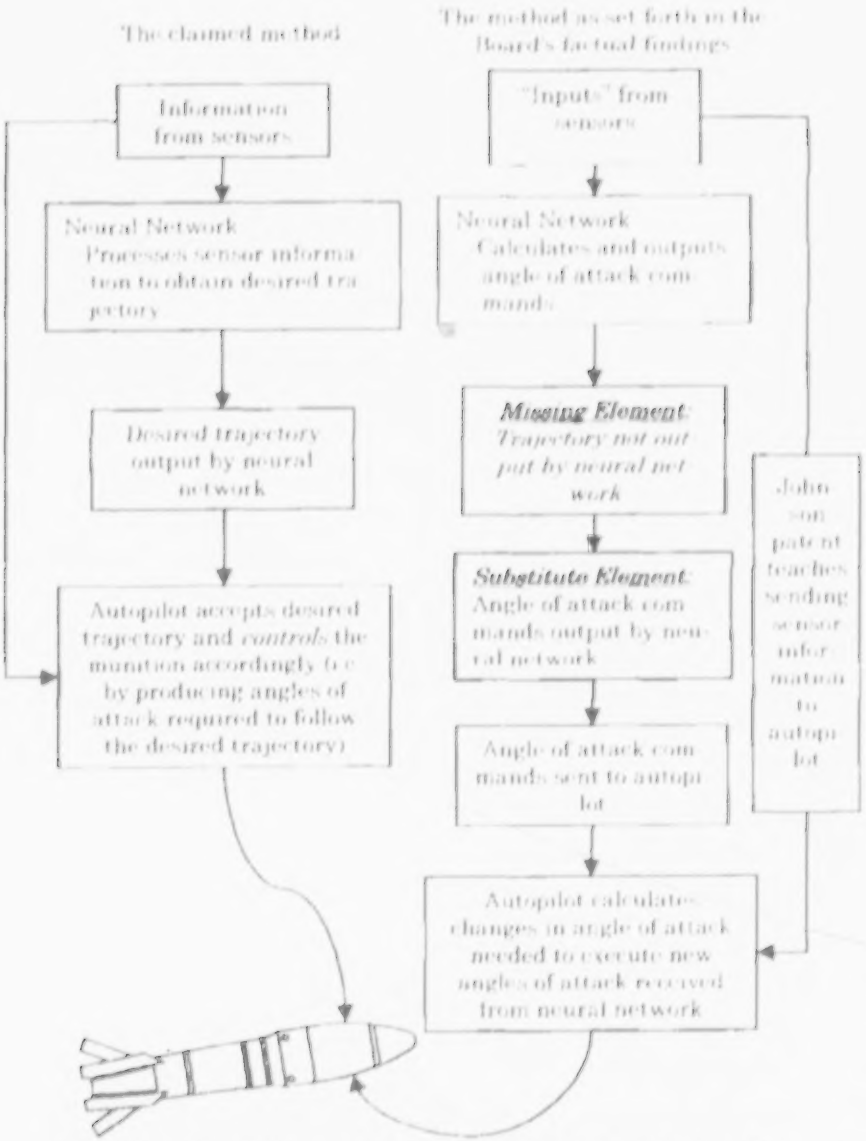
The claimed method
The method as set forth in the Board's factual findings
Information from sensors
Neural Network Processes sensor information to obtain desired trajectory
Desired trajectory output by neural network
Autopilot accepts desired trajectory and controls the munition accordingly (i.e. by producing angles of attack required to follow the desired trajectory)
"Inputs" from sensors
Neural Network Calculates and outputs angle of attack commands
Missing Element: Trajectory not output by neural network
Substitute Element: Angle of attack commands output by neural network
Angle of attack commands sent to autopilot
Autopilot calculates changes in angle of attack needed to execute new angles of attack received from neural network
John son patent teaches sending sensor information to autopilot

FIGURE 1: Parallel comparison of the method produced using the Board's facts with Vaidyanathan's claimed method, illustrating the inconsistencies between the Board's facts and the claimed method.